Leaf-inspired microcontact printing vascular patterns.

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Public Summary:
The vascularization of tissue grafts is critical for maintaining viability of the cells within a transplanted graft. A number of strategies are currently being investigated including very promising microfluidics systems. Here, we explored the potential for generating a vasculature-patterned endothelial cells that could be integrated into distinct layers between sheets of primary cells. Bioinspired from the leaf veins, we generated a reverse mold with a fractal vascular-branching pattern that models the unique spatial arrangement over multiple length scales that precisely mimic branching vasculature. By coating the reverse mold with 50 mug ml(-1) of fibronectin and stamping enabled selective adhesion of the human umbilical vein endothelial cells (HUVECs) to the patterned adhesive matrix, we show that a vascular-branching pattern can be transferred by microcontact printing. Moreover, this pattern can be maintained and transferred to a 3D hydrogel matrix and remains stable for up to 4 d. After 4 d, HUVECs can be observed migrating and sprouting into Matrigel. These printed vascular branching patterns, especially after transfer to 3D hydrogels, provide a viable alternative strategy to the prevascularization of complex tissues.

Scientific Abstract:
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